Lake Norden

Site Description

Location

Water designation number (WDN)	32-0002-00
Legal description	T113N-R53W Sec. 9, 15, 16, 17, 21
County (ies)	Hamlin
Location from nearest town	1 mile east and 0.5 miles north of Lake Norden

Survey Dates and Sampling Information

Survey dates	August 14-15, 2012 (GN)
Gill net sets (n)	4

Morphometry (Figure 1)

Watershed area (acres)	27,787
Surface area (acres)	746
Maximum depth (ft)	8
Mean depth (ft)	6

Ownership and Public Access

Lake Norden is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. A single public access site is located on the southeast shore (Figure 1). The access area is located on School and Public Lands, and maintained by the SDGFP and the City of Lake Norden. The majority of lands adjacent to Lake Norden are owned by private individuals.

Watershed and Land Use

The 27,787 acre Lake St. John sub-watershed (HUC-12) encompasses Lake Norden and is located within the larger Lake Poinsett (HUC-10) watershed. Land use within the watershed is primarily agricultural with a mix of pasture or grassland, cropland, and scattered shelterbelts. Additionally, several homes and cabins are located on the southern shore of Lake Norden.

Water Level Observations

No OHWM or outlet elevation was available for Lake Norden. The elevation of Lake Norden on May 1, 2012 was 1655.4 fmsl, similar to the fall 2011 elevation of 1655.3 fmsl. On October 3, 2012 the water level had declined to an elevation of 1654.0 fmsl.

Fish Management Information

Primary species	Northern Pike, Yellow Perch
Other species	Bigmouth Buffalo, Black Bullhead, Channel Catfish, Common Carp, Walleye, White Sucker, Yellow Bullhead
Lake-specific regulations	none
Management classification	warm-water marginal
Fish consumption advisories	none

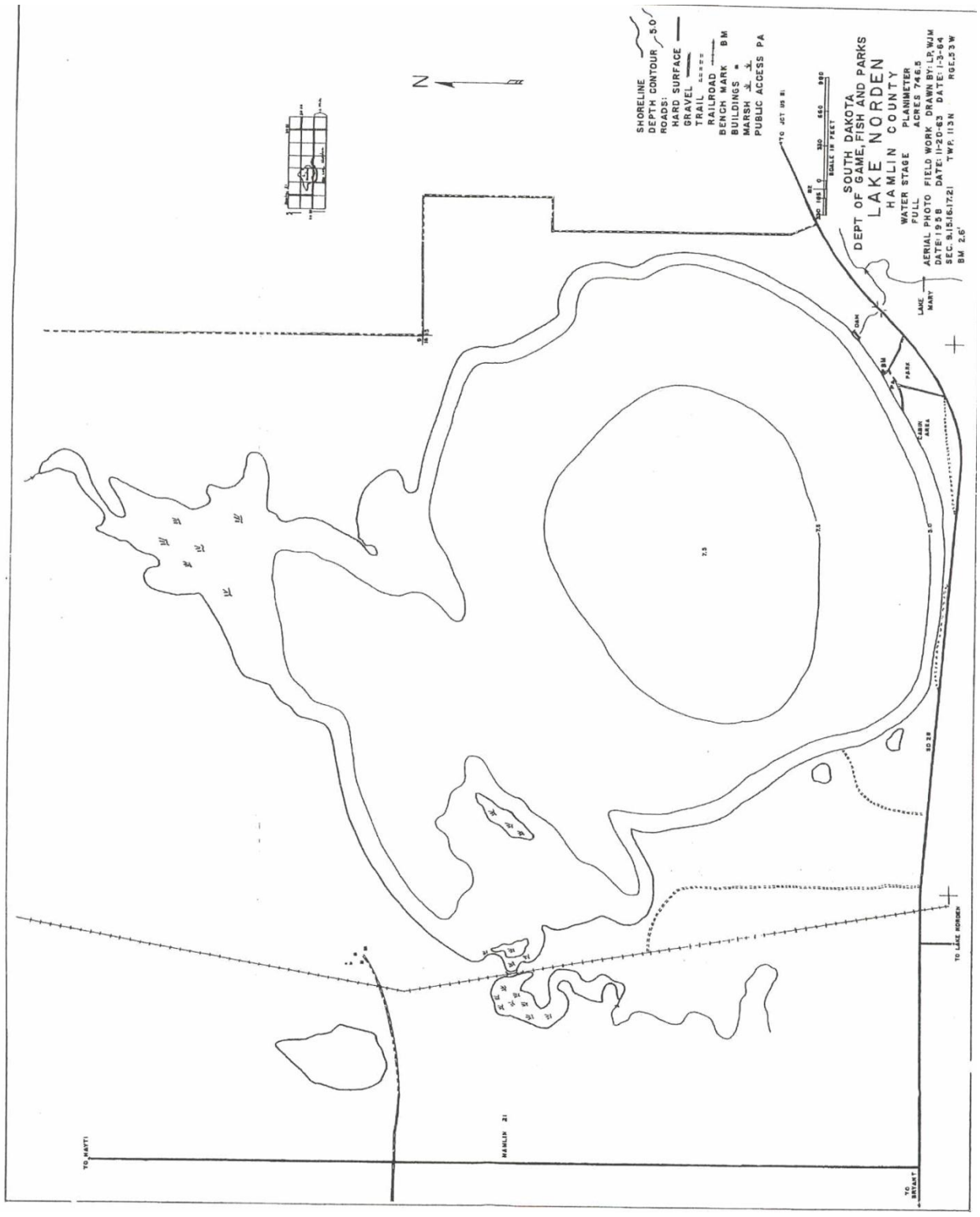

Figure 1. Map depicting depth contours of Lake Norden, Hamlin County, South Dakota.

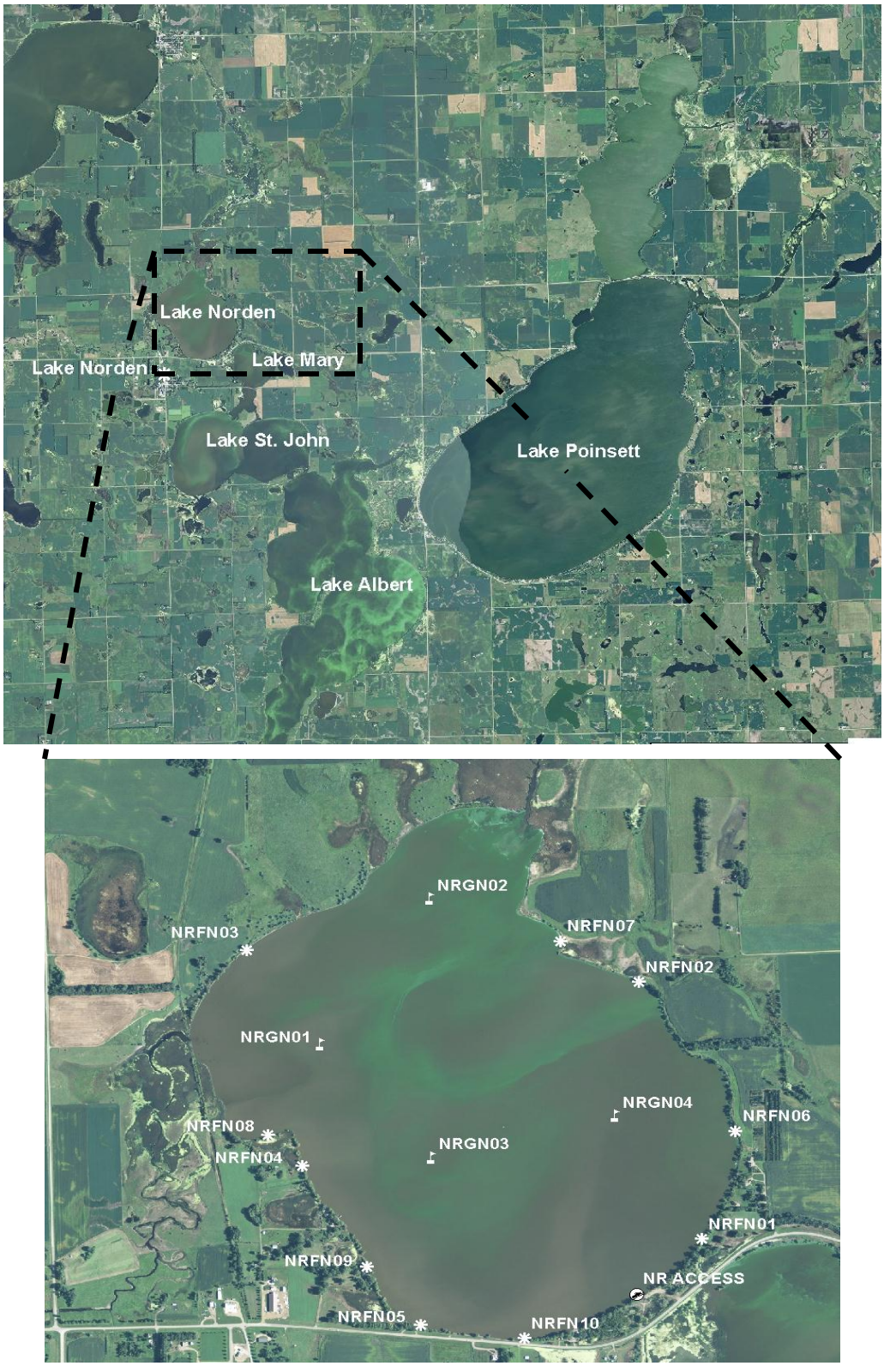

Figure 2. Map depicting geographic locations of several, Hamlin County, South Dakota lakes including Lake Norden (top). Also noted is the access location and standardized net locations for Lake Norden (bottom). NRFN= frame net; NRGN= gill net

Management Objectives

1) Maintain a mean gill net CPUE of stock-length Northern Pike ≥ 3, a PSD of 30-60 and a PSD-P of 5-10.

2) Maintain a mean gill net CPUE of stock-length Yellow Perch ≥ 30, a PSD of 30-60 and a PSD-P of 5-10.

3) Maintain a mean frame net CPUE of stock-length Black Bullhead ≤ 100.

Results and Discussion

Lake Norden is a shallow-natural lake located within a chain of interconnected lakes consisting of Marsh, Lake Norden, Lake Mary, Lake St. John, Lake Albert, and Lake Poinsett. Major surface water inlets to Lake Norden include Dolph Creek, and an unnamed stream that enters on the north. Lake Norden has a history of partial winterkills resulting in a fish community often dominated by rough fish (i.e., Black Bullhead, Bigmouth Buffalo, and Common Carp). Currently, Lake Norden is managed as a Northern Pike and Yellow Perch fishery.

Note: In 2012, frame nets were not utilized as part of the fish community survey on Lake Norden. Therefore, the following results and discussion will focus on those fish species typically assessed using gill net data (e.g., Northern Pike, Walleye, and Yellow Perch).

Primary Species

Northern Pike: The mean gill net CPUE of stock-length Northern Pike was 4.8 (Table 1) and above the minimum objective (≥ 3 stock-length pike/net night). Based on the 2012 gill net catch, relative abundance of Northern Pike in Lake Norden appears to be high.

Gill net sampled Northern Pike ranged in TL from 35 to 80 cm (13.8 to 31.5 in), had a PSD of 53, and a PSD-P of 5 (Table 1; Figure 3). The 2012 PSD and PSD-P were within the management objectives and indicated a relatively-balanced population (defined as PSD of 30-60 and PSD-P of 5-10; Table 3). However, size structure indices should be interpreted with caution as sample size was low (i.e., 19 stock-length Northern Pike).

Northern Pike in the gill net catch had mean Wr values that ranged from 74-80 for all length categories (e.g., stock to quality) sampled, with the mean Wr of stock-length pike being 79 (Table 1). No length-related trends in condition were apparent.

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 10.5 (Table 1) and below the minimum objective (≥ 30 stock-length Yellow Perch/net night). The 2012 gill net CPUE represented a substantial increase from the 2007 CPUE of 1.8 (Table 2) and indicated moderate relative abundance.

Gill net captured Yellow Perch ranged in TL from 9 to 32 cm (3.5 to 12.6 in; Figure 4). The PSD of 52 was within the management objective (30-60); while the PSD-P of 36 was above the management objective (5-10; Table 3) and indicated a relatively-high proportion of Yellow Perch ≥ preferred-length (25 cm; 10 in) in the population (Figure 4).

Otoliths were collected from a sub-sample of gill net captured Yellow Perch. Age estimates revealed relatively consistent Yellow Perch recruitment with six consecutive year classes (2007-2012) present in the 2012 gill net catch. The 2011 (age-1) year class was the most abundant and comprised 45% of Yellow Perch in the gill net catch (Table 4).

Although sample sizes were low, growth rates of Yellow Perch in Lake Norden appear to be relatively fast (Table 5). In 2012, the weighted mean TL at capture for age-1, age-2, age-3, and age-4 Yellow Perch was 168, 224, 266, and 300 mm (6.6, 8.8, 10.5, and 11.8 in), respectively (Table 5). Gill net captured Yellow Perch had high condition, with mean Wr values that exceeded 100 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length Yellow Perch was 107 (Table 1) and no length-related trends in condition were apparent.

Other Species

Walleye: The shallow nature and susceptibility of Lake Norden to winterkill exclude Walleye from being a primary management species. However, the potential exists for occasional strong year classes to develop and provide angling opportunities. Therefore, stockings should continue provided water levels are favorable (i.e., lake is full), excess Walleye are available, and higher priority stockings have been completed.

In 2012, the mean gill net CPUE of stock-length Walleye was 9.8 (Table 1) and represented a substantial increase from the 0.8 observed in 2007 (Table 1; Table 2). Currently, the relative abundance of Walleye is considered to be moderate.

Walleye captured in the gill net catch ranged in TL from 24 to 52 cm (9.4 to 20.5 in), had a PSD of 72 and a PSD-P of 8 (Table 1; Figure 5). Age estimates made using otoliths suggested the presence of five Walleye year classes (2007-2011) in the gill net catch, with the 2010 cohort being the most represented (Table 6). Year classes produced in 2007 and 2010 coincided with fry and small fingerling stockings; while the 2008, 2009, and 2011 year classes appear to be naturally produced (Table 6; Table 8). The contribution of stocked or naturally-produced Walleye to year classes produced during stocked years is unknown, as stocked individuals were unmarked making it difficult to differentiate stocked from naturally-produced Walleye. In 2012, approximately 375,000 Walleye fry were stocked into Lake Norden (Table 8); however, recruitment of this cohort is currently unknown and will be assessed in future surveys.

Growth rates appear to be relatively fast as the weighted mean TL at capture of age-2 and age-3 Walleye was 390 and 467 mm (15.4 and 18.4 in), respectively (Table 7). Mean Wr values of Walleye in the gill net catch ranged from 85 to 91 for all length categories (e.g., stock to quality) sampled, with the mean Wr of stock-length Walleye being 88 (Table 1). No length-related trends in condition were apparent.

Other: Black Bullhead, Common Carp, and White Sucker were other fish species captured in low numbers during the 2012 survey (Table 1).

Management Recommendations

1) Conduct fish community assessment surveys on an every fifth year basis (next survey scheduled in summer 2017) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Collect otoliths from Walleye and Yellow Perch to assess age structure and growth rates of each population.

3) Stock Walleye on a biennial basis provided water levels are favorable (i.e., lake is full), excess Walleye are available, and other higher priority stockings have been completed.

4) Monitor water levels and winter/summer kill events. In cases of substantial winter/summer kill, stock Northern Pike and Yellow Perch to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in experimental gill nets from Lake Norden, 2012. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= Black Bullhead; COC= Common Carp; NOP= Northern Pike; WAE= Walleye; WHS= White Sucker; YEP= Yellow Perch

	Abundance		Stock Density Indices				Condition	
Species	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Gill Nets								
BLB	9.8	6.1	72	12	3	4	93	1
COC	0.3	0.4	0	---	0	---	120	---
NOP	4.8	1.4	53	20	5	9	79	4
WAE	9.8	4.3	72	12	8	7	88	1
WHS	2.8	1.4	91	16	91	16	104	3
YEP	10.5	4.5	52	13	36	13	107	1

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Lake Norden, 2007-2012. BIB= Bigmouth Buffalo; BLB= Black Bullhead; CCF= Channel Catfish; COC= Common Carp; NOP= Northern Pike; WAE= Walleye; WHS= White Sucker; YEB= Yellow Bullhead; YEP= Yellow Perch

	CPUE					
Species	2007	2008	2009	2010	2011	2012
Frame nets						
BIB	5.4	---	---	---	---	---
BLB	2.5	---	---	---	---	---
COC	3.2	---	---	---	---	---
NOP	2.5	---	---	---	---	---
WHS	1.6	---	---	---	---	---
YEB	0.1	---	---	---	---	---
YEP	0.1	---	---	---	---	---
Gill nets						
BIB	0.3	---	---	---	---	0.0
BLB	3.8	---	---	---	---	9.8
CCF	0.3	---	---	---	---	0.0
COC	7.8	---	---	---	---	0.3
NOP	3.0	---	---	---	---	4.8
WAE	0.8	---	---	---	---	9.8
WHS	3.3	---	---	---	---	2.8
YEP	1.8	---	---	---	---	10.5

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured in frame nets and experimental gill nets from Lake Norden, 2007-2012. BLB= Black Bullhead; NOP= Northern Pike; WAE = Walleye; YEP = Yellow Perch

Species	2007	2008	2009	2010	2011	2012	Objective
Frame nets							
BLB							
CPUE	3	---	---	---	---	---	≤ 100
PSD	32	---	---	---	---	---	---
PSD-P	16	---	---	---	---	---	---
Wr	91	---	---	---	---	---	---
Gill nets							
NOP							
CPUE	3	---	---	---	---	5	≥ 3
PSD	75	---	---	---	---	53	30-60
PSD-P	17	---	---	---	---	5	5-10
Wr	95	---	---	---	---	79	---
WAE							
CPUE	1	---	---	---	---	10	---
PSD	100	---	---	---	---	72	---
PSD-P	100	---	---	---	---	8	---
Wr	101	---	---	---	---	88	---
YEP							
CPUE	2	---	---	---	---	11	≥ 30
PSD	29	---	---	---	---	52	30-60
PSD-P	0	---	---	---	---	36	5-10
Wr	107	---	---	---	---	107	---

Table 4. Year class distribution based on the expanded age/length summary for Yellow Perch sampled in gill nets from Lake Norden, 2012.

	Year Class					
Survey Year	2012	2011	2010	2009	2008	2007
2012	2	20	6	5	7	4

Table 5. Weighted mean TL (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Lake Norden, 2012.

	Age					
Year	0	1	2	3	4	5
2012						
Male	97 (2)	166 (5)	217 (1)	251 (3)	---	269 (1)
Female	---	169 (15)	225 (5)	289 (2)	300 (7)	322 (3)
Combined	97 (2)	168 (20)	224 (6)	266 (5)	300 (7)	309 (4)

Table 6. Year class distribution based on the expanded age/length summary for Walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from Lake Norden, 2007-2012.

	Year Class											
Survey Year	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
2012		7	18	9	2	4						
2007[1]	---	---	---	---	---	3						3
# stocked												
fry	375					800						
sm. fingerling			60									
lg. fingerling												

[1] Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 7. Weighted mean TL at capture (mm) for Walleye sampled in experimental gill nets (expanded sample size) from Lake Norden, 2007-2012. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

	Age						
Year	0	1	2	3	4	5	6
2012	---	282(7)	390(18)	467(9)	504(2)	498(4)	---
2007	182(3)	---	---	---	---	---	595(3)

Table 8. Stocking history including size and number for fishes stocked into Lake Norden, 2001-2012. WAE= Walleye

Year	Species	Size	Number
2007	WAE	fry	800,000
2010	WAE	small fingerlings	59,660
2012	WAE	fry	375,000

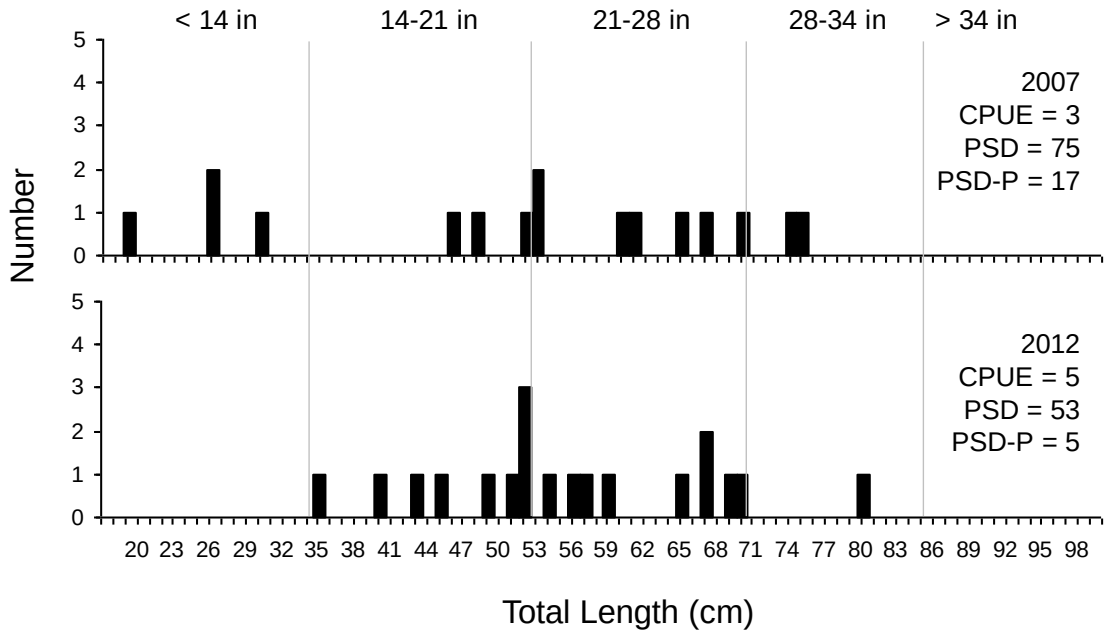

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Northern Pike captured using experimental gill nets in Lake Norden, 2007 and 2012.

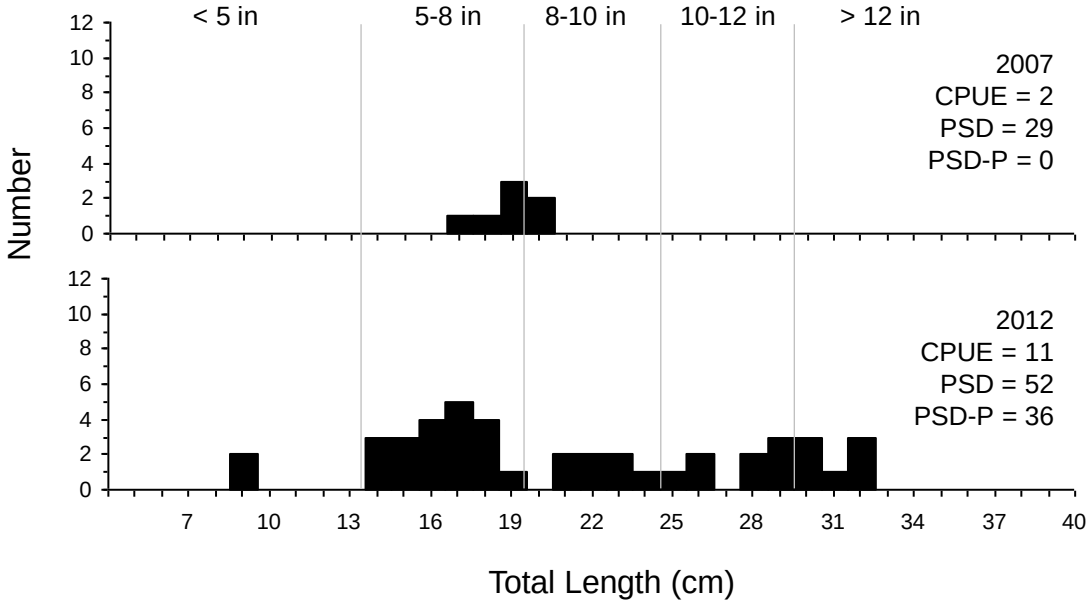

Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in Lake Norden, 2007 and 2012.

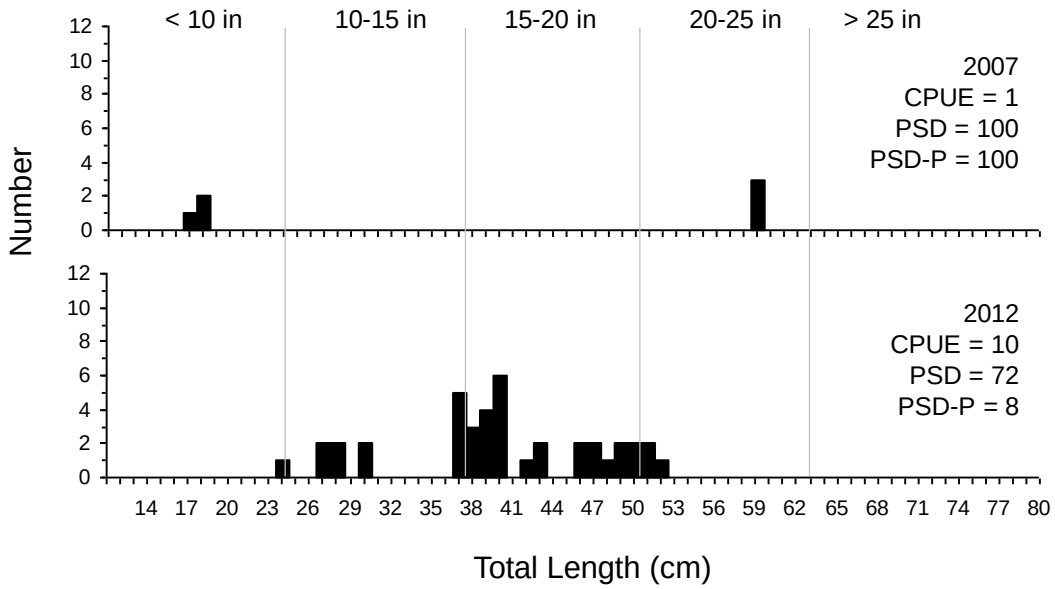

Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in Lake Norden, 2007 and 2012.